Structural and Thermal Investigation of the Eneabba Region of the Perth Basin, Western Australia.

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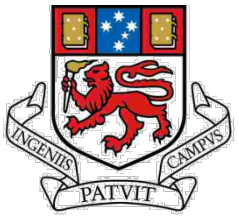

UNIVERSITY OF TASMANIA

A research thesis submitted in partial fulfillment of the requirement of a Bachelor of Science with Honours.

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Project Sponsor:

School of Earth Sciences, University of Tasmania
Australia, November 2010

Declaration of own work

This thesis is my own work and contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution, and to the best of my knowledge, contains no material previously published by any other person, except where due reference is made in the text of the thesis.

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Abstract

A structural and thermal investigation was undertaken on an area centred on exploration permits currently held by Granite Power Pty Ltd, in the vicinity of Eneabba, in the north Perth Basin using a combination of potential field geophysics, petrophysical and thermal property measurements followed by 1D and 2D thermal modelling.

Petrophysical results show that the Kockatea Shale is the primary thermal insulator within the area of investigation, and 1D modelling of drill holes show that the geotherm is strongly deflected by this unit. The heat generation of basement samples is greater than the sedimentary sequence indicating a possible heat source at depth. Shale samples also exhibit elevated heat generation values.

Gravity data is characterised by large gravitational gradients within the area of investigation, associated primarily with variation in depth to the basement sequence due to major fault structures. Magnetic response of the basin is subdued in a manner consistent with the presence of a thick sedimentary sequence. Forward modelling of the potential field data, constrained by interpreted seismic data, suggests possible changes in lithology within the basement across the area of investigation.

2D finite element modelling of the thermal response of the basin sequence illustrates highest thermal gradients within the Kockatea Shale, and shows a coupling between variations in depth to basement, and depth to isotherms. Models show possible enhanced geothermal system targets within basement rock in the western potion of the area. Hot sedimentary aquifer system targets are also present within the Permian sequence in most of the eastern portion of the area of investigation where the sedimentary sequence is thicker than 4km.

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Acknowledgements

I would like to thank my Supervisors Dr. Anya Reading and Dr. Michael Roach for their invaluable help and support throughout the year. Special thanks to Roachie in his capacity as the resident geophys computer.

Thanks to *Granite Power* for sponsorship, logistical support and the chance to work on such an interesting topic specifically Dr. Duanne White for help at the Perth Core store, Dr. Catherine Stafford for help with planning the year and Daniella Vecchio for handling logistics.

Thanks also to *Exploration Data Services* for supplying scanned seismic sections. Also to the *Western Australian Department of Mines* for supplying digital data free of charge and the team at the *Perth Core Library* for help with selecting samples and giving us permission to take samples off site.

Thanks to the CODES/SES Staff in general for making me feel so welcome, and specifically thanks to

- Chris (Toffa) Allen for his help in the field and his advice in the lab. I'd also like to thank
- Al at the Lapidary for teaching me how to cut and polish my samples without making them explode and for making my thin sections
- Phil Robinson & Katie McGoldick and Ian Little for processing my XRF and ICPMS geochemical data
- Leon Graham for help with *Escript* and the *linux* operating system

Thanks to the guys from Leeman for being so accommodating during my time in the field.

Of course I need to thank the entire Honours Crew for 2010: Dan 'The Mak Man' Macklin, Markus, Michael 'the computer lord' Tomlin, Josh, Tim, Emma, Kath 'the ATM' Webb, Sarge, Hamish 'The Hämmer' Johns, Kyan and Donno.

Special thanks to all the awesome internationals I've met this year as well as the locals. I couldn't have done it without such a great group of friends.

Final thanks of course to the Porch for its steadfast support even in the face of complete misunderstanding from the general populace.

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Appendix G.1: *1D and 2D Thermal Model Comparisons*